



# Future Physics Opportunities at the Oak Ridge National Laboratory Spallation Neutron Source

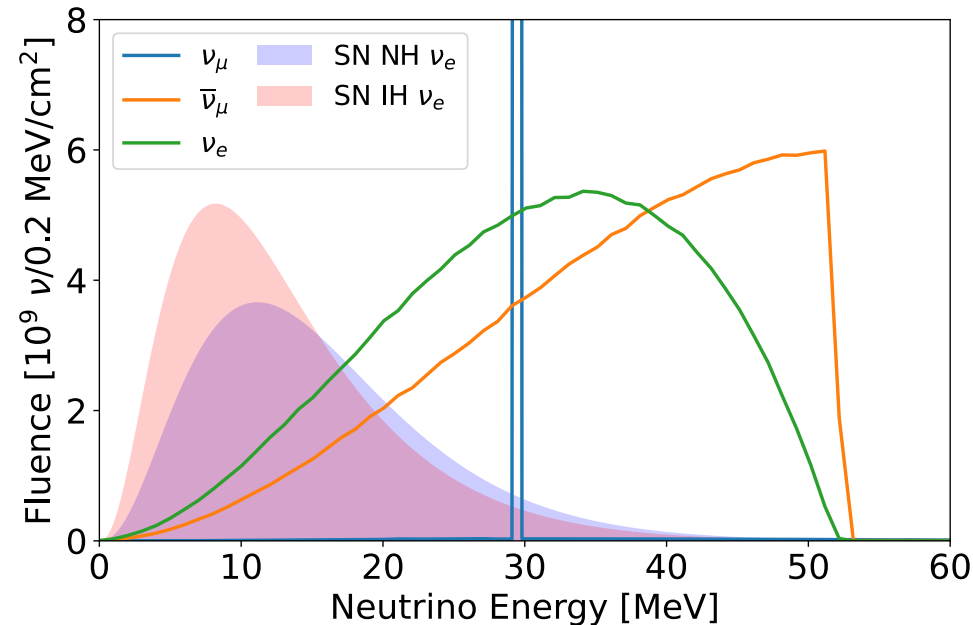
Jason Newby (ORNL), Dan Pershey (Duke),  
Rebecca Rapp (W&J College), Yun-Tse Tsai (SLAC)

P5 Town Hall Open Session

March 24th, 2023

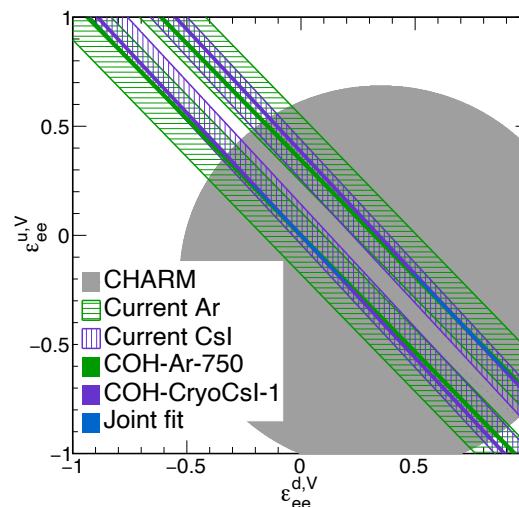
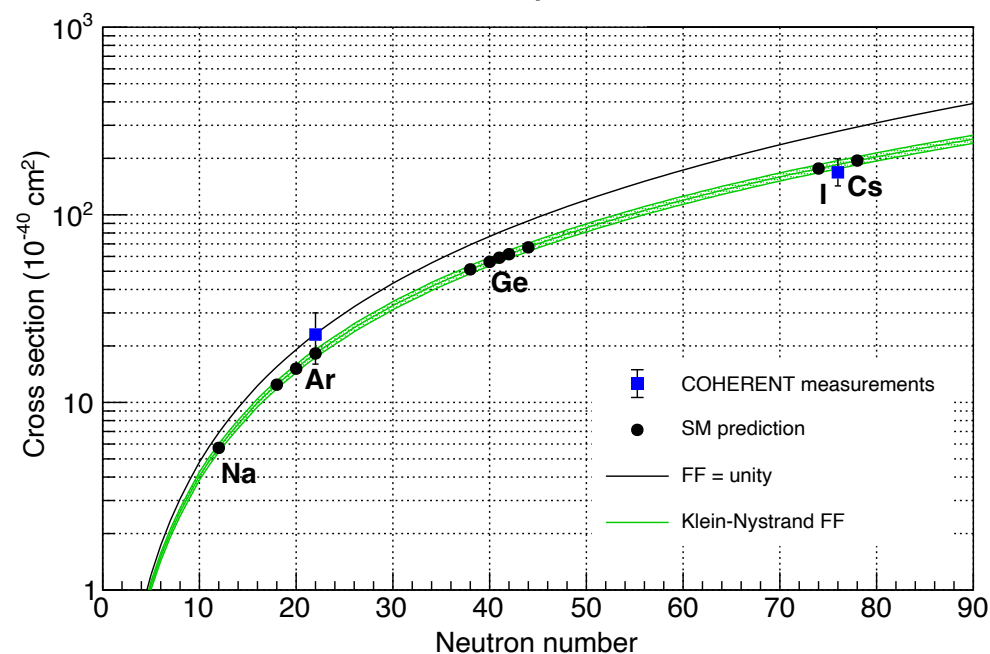
# Physics with SNS Neutrinos

## SNS $\nu$ : $\pi^+$ decay-at-rest

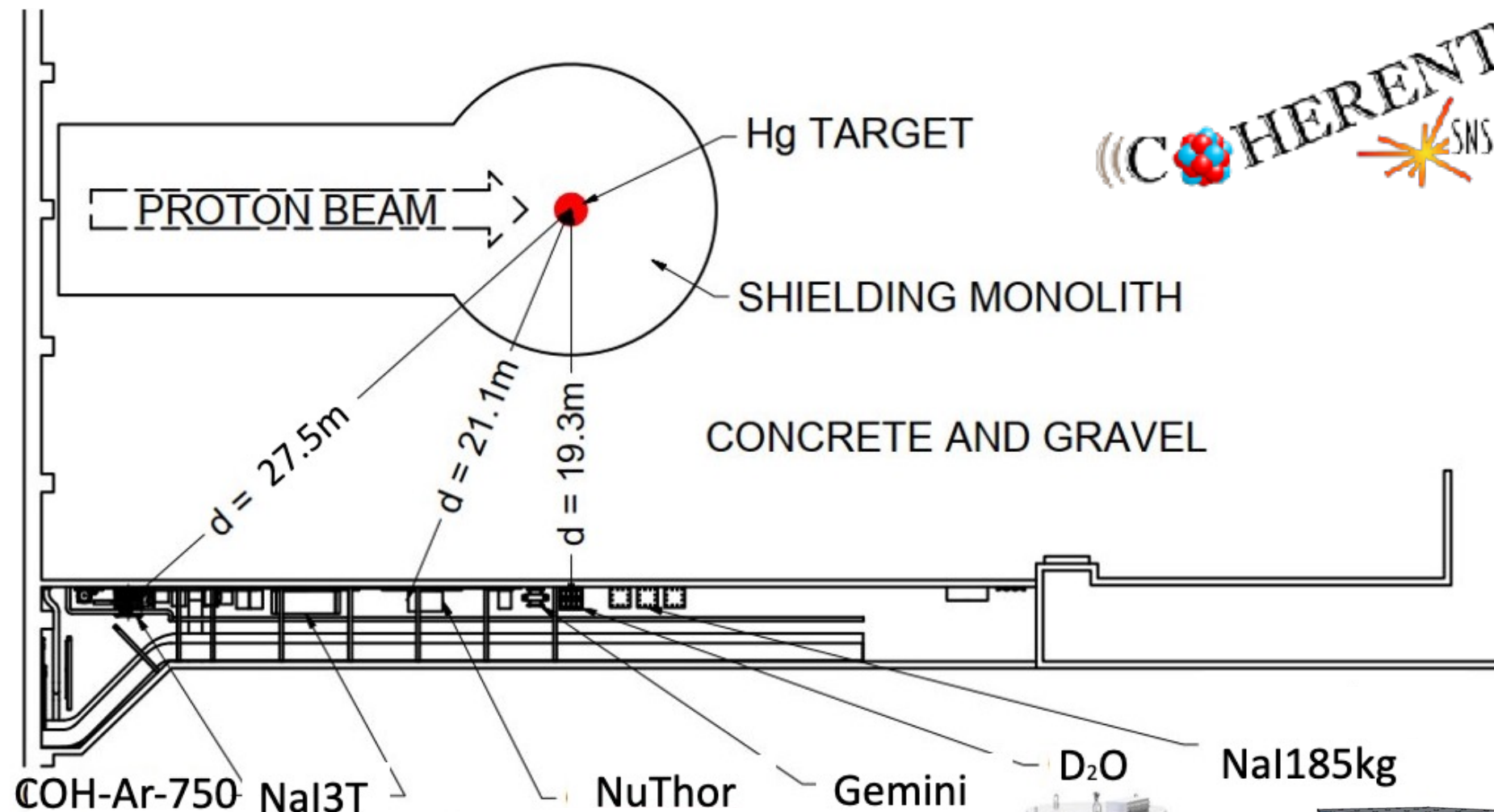


- Coherent Elastic  $\nu$ -Nucleus Scattering (CEvNS), discovered in 2017 by COHERENT here
- Test SM and probe BSM by precisely measuring CEvNS
- Inelastic  $\nu$  interactions: relevant to supernova neutrino measurements in DUNE

## CEvNS Results by COHERENT

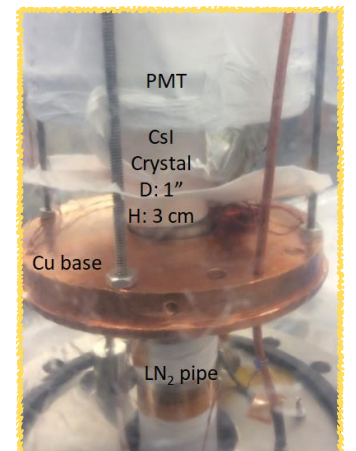


# Current & Potential Detectors

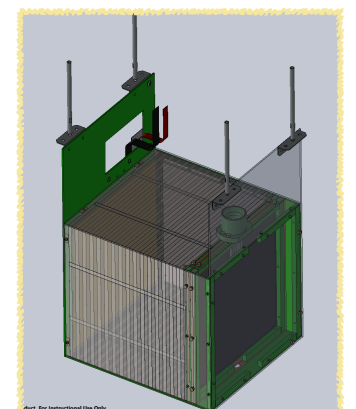



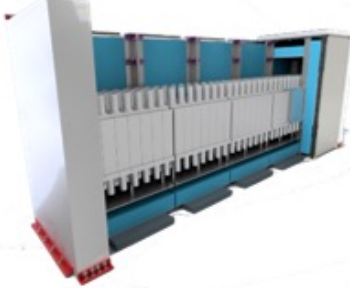



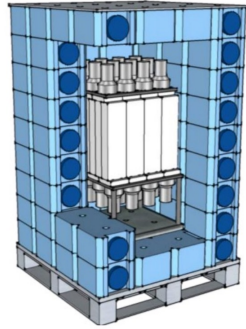
Potential future additions

10-kg Cryo-CsI



250-kg LArTPC



COH-Ar-750	NaI3T	NuThor	Gemini	D <sub>2</sub> O	NaI185kg
					
750-kg LAr scintillation detector Under construction	2425-kg NaI Being deployed	52-kg <sup>232</sup> Th v <sub>e</sub> -Th CC Since 2022	18-kg Ge Since 2022	2x592-kg D <sub>2</sub> O Module I in commissioning	185-kg NaI v <sub>e</sub> -I CC Since 2016



At present, 1 GeV protons @ 1.4 MW @  
60Hz at the First Target Station (FTS)  
(COHERENT Experiment)  
Will upgrade to 1.3 GeV @ 2MW in 2024

COHERENT publication  
COHERENT white paper  
STS white paper

Second Target Station (STS) starting ~2032:  
0.7 MW at 15 Hz  
Large space for future potential detectors,  
e.g. 10-ton-scale LAr detectors, being  
designed  
Similar shielding to FTS  
FTS will have 2 MW of protons at 45Hz

Uniquely intense, clean,  
pulsed sources of  
neutrinos @ ~10 MeV!